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Micro-tool grabs cells in hard-to-reach places

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WASHINGTON: Dust-particle sized devices developed recently by scientists, activated by heat or bio-chemical signals, can grab and remove living cells from hard-to-reach places, without having to use wires, tubes or batteries.

Just a tenth of a millimetre across, low cost microgrippers performed a biopsy-like procedure in lab tests, on animal tissue placed at the end of a narrow tube.

Although these functional micro-tools require fine-tuning before they are ready for use on humans, they represent a paradigm shift in engineering, said David H. Gracias, project supervisor.

"We've demonstrated tiny inexpensive tools that can be triggered en masse by non-toxic biochemicals," added Gracias, project supervisor and assistant professor of chemical and biomolecular engineering in Johns Hopkins' Whiting School of Engineering.

"This is an important first step toward creating a new set of biochemically responsive and perhaps even autonomous micro- and nano-scale surgical tools that could help doctors diagnose illnesses and administer treatment in a more efficient, less invasive way."

Today, doctors who wish to collect cells or manipulate a bit of tissue inside a patient's body often use tethered microgrippers connected to thin wires or tubes.

But these tethers can make it difficult to navigate the tool through tortuous or hard-to-reach locations. To eliminate this problem, the untethered grippers devised by Gracias' team contain gold-plated nickel, allowing them to be steered by magnets outside the body.

"With this method, we were able to remotely move the microgrippers a relatively long distance over tissue without getting stuck," he said.

The microgripper design - six three-jointed digits extended from a central "palm" - resembles a crab. In fact, the joint design was inspired by that of crabs.

The microgrippers' grasping ability is rooted in the chemical composition of the joints embedded in the finger-like digits, said a Johns Hopkins release.

The experiments showed that the tetherless microgripper concept is viable and has great potential for medical applications, the researchers said. Gracias' team is now working to overcome some remaining hurdles.

The Johns Hopkins Technology Transfer staff has obtained a provisional US patent covering the team's inventions and is seeking international patent protection.